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Synthesis and Characterization of Heterocyclic Compounds Derived from 1, 1- bis (4-aminophenyl) cyclohexane and their study biological activity

Olfat A Nief * , Ebtihal Q. Abdalla** , Hall M. Gareeb*** ,Nahidah A. Jinzeel*

*Department of Chemistry, College of Science, Al-Mustansiriya University, Baghdad, Iraq

**Department of Chemistry .,College of Science ,University of Tikrit ,Tikrit,Iraq

***Department of Chemistry .,College of Science ,University of kirkuk ,karkuk,Iraq

E-mail address: olfat_nife@yahoo.com, Olfat_Nife@uomustanisirah.edu.iq

Abstract

Synthesized and characterization of new sulfonamide derivatives (schiff base , ,azo , azide, chalcone and 1,2,3- triazole) derived from (1, 1- bis (4-aminophenyl) cyclohexane [A1]). The synthesis compound [A2] include the reaction of compound [A1] with Toluene -4- Sulfonyl chloride while the azo compound [A3] produce from the reaction of diazonium salt with salicylaldehyde , then the azo compound [A3] were converted to chalcone derivative [A4] by reaction the azo compound [A3] with acetophenone . Afterward reflux the azo compound with 2-amino pyrimidine to formation schiff base [A5] . Azide derivative [A6] synthesized via the reaction of diazonium salt with sodium azide . The new 1,2,3- triazole derivatives [A7,A8] were obtained from treatment azide compound[A6] with each ethyl acetoacetate and acetyl acetone ,respectively . The structures of the compounds were confirmed by ^{1}HNMR, ^{13}CNMR, FT-IR spectroscopy and (C.H.N.) elementary analysis. The synthesis compounds were evaluated for antibacterial (*Staphylococcus aureus , Becillus Cereus, Escherichia coli, Pseudomonas aeruginosa* and anti-fungal (*Aspergillus niger* and *Aspergillus fumigatus* by serial dilution method.

Keywords: Sulfonamide, 4-methylbenzenesulfonamide, antibacterial activity, Antifungal activity ,Chalcone

Introduction

Heterocycles containing sulfonamido moieties have interested eviden t attention due to their important biological properties and their character as pharmacophores (Firyal W.at el. 2017; Luo et al. 2011*)* .

Sulfonamides have been used as therapeutic agent, first as antibacterial agents but have subsequently to treat other diseases . The first sulfonamide which was known to be active in vivo metabolite of red azo dye was prontosil (Muhammad at el. 2015 ,Chandak, et al 2013). Furthermore, sulfonamides are well-known to inhibit different enzymes such as carbonic anhydrase (Lewis, at el 2006).

Study of Sulfonamide chemistry is very important. For example, a number of Sulfonamid derivatives are applied in antiprotozoal (Stokes et al 2012) ; antifungal (Chibale et .al 2001) ; antiinflammatory (Rahavi et .al 2008); anticancer (Ghorab, et. al 2010 :2009:2016 , Bano, et. al 2011) nonpeptidic vasopressin receptor antagonists (Kennedy et .al 1999) and translation initiation inhibitors (Serradeil et .al 2001, Natarajan et al 2004) . Sulfonamide was antimicrobial drug that its chemical moiety is also present in other medications, diuretics (containing hydrochlorothiazide), loop diuretics (containing furosemide). Abdulhakeem et al 2011, Supuran et al 2003). In our manuscript study , new encouraging bioactive compounds based on the sulfonamide moiety were manufactured by a simple and proficient method, followed by the valuation of their biological activities .

We believe that, this route has a wide range of applications and we have great expectations for the future development of new compounds .

Experimental

2.1. Materials and measurements

Chemicals were purchased from (Aldrich Chemicals Co.) and were used without further purification .Melting points of synthesis compounds were determined on Gallenkamp capillary melting point apparatus by open capillary tube and was uncorrected . The FT-IR spectra in the range (4000-400) cm-1 were recorded using on FT-IR.8400S Shimadzu Spectrophotometer. ^{1}H, ^{13}C-NMR spectra were obtained with Bruker Spectrophotometer model ultra-shield at 300 MHz in DMSO -$d_6$solution with the TMS as internal standard, Elemental analysis measured on E.A.300, Euro- Vector, Italy, 2003.

2.2 Synthesis of compounds

1.Synthesisof N-{4-[1-(4-Amino-phenyl)-cyclohexyl]-phenyl}-4-methyl-benzenesulfonamide(A2).

Amixture of Toluene -4- Sulfonyl chloride (0.01 mole ,1.9 gm) and[1, 1- bis (4-aminophenyl) cyclohexane (0.01 mole,2.66gm) (Vygodskii et al 1996 ;Yi et al 1997; Yi et al 1999) with (0.01 mole,1.01gm) Triethyl amine in dry benzene (50 ml) was refluxed for 15 hours with stirring . The resulted solution was cooled to room temperature then poured into crushed ice with stirring and the obtained precipitate was filtered , dried and recrystallized from acetone

N-{4-[1-(4-Amino-phenyl)-cyclohexyl]-phenyl}-4-methyl-benzenesulfonamide(A2).

Yield: (65%) : M.P: 186-187 °C , FTIR (v, cm−1) [Fig.1]: 3359 , 3272 (NH_2), 3265 (NH),1390,1165 (O=S=O) .(3097,3047)(C-H) Ar., 2975,2855 (C-H) Aliph., 1666–1457 (C=C) Ar., 1H-NMR (DMSO-d_6) δ ppm [Fig.2] : 2.5 ppm (s, 3H, CH_3) , 2.3-1.4 ppm(m. 10H.,cyclohexyl ring), 7.3-7.9 (m, 12H, Ar-H), 8.5 (s, 2H, NH_2) , 6.3 (s, 1H, NH) .^{13}C-NMR (DMSO-d_6) δ ppm[Fig.3] : (124-144)) (CHAr),, 21.0 (CH_3-Ar) , 22.1-29.7 (C-cyclohexyl) ; Anal. Calcd for $C_{25}H_{28}N_2O_2S$ (Mol. Wt.: 420.57) C , 71.40; H, 6.71; N,6.66 ; S, 7.62, Found: C, 70.60; H, 6.01; N, 5.99; S, 7.14.

2. Synthesis of diazonium salt[N-(4-{1-[4-(chlorodiazenyl)-phenyl]-cyclohexyl}-phenyl)-4-methyl-benzenesulfonamide)

A solution of compound (A1) (0.01 mole) in concentration HCl (3mL) was cooled to (0-5)˚C .A cooled solution of sodium nitrite (0.01 mole , 1.5 g) in 10 mL of water was added dropwise during 10 min , and then the reaction mixture was stirred of for 10 min.

3. Synthesis of N-(4-{1-[4-(3-Formyl-4-hydroxy-phenylazo)-phenyl]-cyclohexyl}-phenyl)-4-methyl-benzenesulfonamide (A3).

To solution of salicylaldehyde at low temperature (0.01 mole ,1.22 g) in %10 NaOH (12mL) a solution of diazonium salt was added gradually and very slowly . let the solution stand for 30 min in ice bath .The precipitate was filtered and wash with water.

N-(4-{1-[4-(3-Formyl-4-hydroxy-phenylazo)-phenyl]-cyclohexyl}-phenyl)-4-methyl- benzenesulfonamide(A3).

Yield: 63% ; M.p.: 276-277 °C ; FTIR (v , cm−1) Fig[4] : 3408(O-H), 3326-3124(NH), 2781 (C-H ald), 3082, 3024 (C-H)Ar, 2943 ,2867 (C-H)Aliph, , 1643–1482 (C=C)Ar, 1545 (N=N) , 1338 ,1145 (O=S=O) , 1720 (CO); ^{1} H-NMR, DMSO-d6, δ, ppm)Fig [5]: 9.97 (C-H ald), 8.34-7.30 (m,15H, Ar-H),10.01 (s,1H,O-H), 4.19 (s, 1H, NH), 2.99 (s, 3H, CH_3) , 2.31-1.78 ppm(m. 10H.,cyclohexyl ring). : ^{13}C-NMR (DMSO-d_6) δ ppm(Fig [6]): (123.8-159.1) ppm (C- Ar.), 180.1 (C=O), (27.9-24,1) (C-cyclohexyl ring) , 20.1 (CH_3-Ar) :Anal. Calcd for $C_{32}H_{31}N_3O_4S$ (Mol. Wt.: 553.67), C, 69.42; H, 5.64; N, 7.59; S, 5.79 :Found: C, 70.02; H, 5.69; N, 7.98; S, 6.16 .

4. SynthesisN-[4-(1-{4-[4-Hydroxy-3-(3-oxo-3-phenyl-propenyl)-phenylazo]-phenyl}-cyclohexyl)-phenyl]-4-methyl-benzenesulfonamide(A4).

Compound (A3) (0.01 mol ,5.53 g) was dissolved in absolute ethanol (30 ml) in a 250ml flask and when all the aldehyde had been dissolved by stirring , a solution of (0.01 mole , 1.2 g) of (acetonphenone) in (5 mL ,% 40) NaOH was added .after about 24 h of stirring ,let the

mixture to stand in the refrigerator for 24h ,a precipitate filtered and washed with DMF solvent .

N-[4-(1-{4-[4-Hydroxy-3-(3-oxo-3-phenyl-propenyl)-phenylazo]-phenyl}-cyclohexyl)-phenyl]-4-methyl-benzenesulfonamide(A4).

Yield: 68%. M.p.: 198-199 °C; FT-IR (v, cm^{-1}): 3250 (N-H), 1670 (C=O), 1634, (C=C), 1379 ,1183 (O=S=O); 3380-3270 (O-H), , 2765 (C-H ald), 3088, 3065 (C-H)Ar, 2940 ,2876 (C-H)Aliph, , 1668–1458 (C=C)Ar, 1570 (N=N) : ^{1} H-NMR (DMSO-d6, δ, ppm): 7.62 (dd, 2H, CH=CH) , 8.37-7.73 (m, 20 H, Ar-H), 5.74 (s ,1H,O-H) ,4.6 (s, 1H, NH), 2.3 (s, 3H,CH_3) and at δ 2.42-1.49 ppm(m .10H. cyclohexyl ring): ^{13}C-NMR (DMSO-d_6) δ ppm : (115.3- 157.7) (C Ar , CH=CH) , δ (39.7-21.9) (C- cyclohexyl ring) , 20.9 (C- methyl group). Anal. Calcd for $C_{40}H_{37}N_3O_4S$ (Mol. Wt.: 655.80), C, 73.26; H, 5.69; N, 6.41; S, 4.89 Found: C, 73.02; H, 5.64; N, 6.21; S, 5.16 .

5 .Synethsis of N-(4-((4-hydroxy -3-((pyrimidin -2-ylimino) methyl) phenyl) diazenyl)phenyl)-4-methylbenzenesulfonamide (A5).

A mixture of compound (A3) (0.01 mol .5,43 gm) and 2-amino pyrimidine (0.01 mol , 0.95 gm) was refluxed in absolute ethanol (25 mL) for 9 hr.. The reaction mixture was cooled and the product obtained recrystallized from ethanol.

of N-(4-((4- hydroxy -3-((pyrimidin -2-ylimino) methyl) phenyl) diazenyl) phenyl)-4-methylbenzenesulfonamide (A5).

Yield: 79 % ; M.p.: 186-187 °C; FT-IR (v, cm^{-1}): 3410-3130 (O-H), 1625 (C=N), 1378,1165 (O=S=O), 3096, 3055 (C-H)Ar, 2910 ,2867 (C-H)Aliph, , 1668–1458 (C=C) Ar, 1565 (N=N).^{1} H-NMR (DMSO-d6, δ, ppm) Fig(7): 8.3-8.0 (m,3H, proton of pyrimidine) ,8.56 (s, 1H, N=CH), 7.95-7.28 (m, 15H, Ar-H), 5.33 (s,1H,O-H), 4.353 (s, 1H, NH), 3.29 (s, 3H, CH_3)., 2.35-1.98 (m. 10H.,cyclohexyl ring). ^{13}C-NMR (DMSO-d_6) δ ppm : 164.3 (CH=N-) , 115.8-150.1 (C-Ar. ring), 39.7-21.9 (C-cyclohexyl ring , 20.9 C- methyl group.) Anal. Calcd for $C_{36}H_{34}N_6O_3S$ (Mol. Wt.: 630.76), C, 68.55; H, 5.43; N, 13.32; S, 5.08 Found: C, 67.98; H, 5.34; N, 12.99; S, 5.16.

6.Synthesis of N-{4-[1-(4-Azido -phenyl)- cyclohexyl]-phenyl}-4-methyl -benzenesulfonamide (A6).

(2.5 mL) of an aqueous solution of sodium azide (0.012 mole ,0.78 g) was added dropwise to a solution of diazonium salt . The mixture was stirred for 20 min to give dark brown solid compound (A6).

N-{4-[1-(4-Azido-phenyl)-cyclohexyl]-phenyl}-4-methyl-benzenesulfonamide (A6).

Yield: 58% , M.p.: 250-251 °C , FT-IR (v, cm^{-1}): 3244 (NH), 3100, 3087 (C-H)Ar, 2940 ,2837 (C-H)Aliph, , 1658–1456 (C=C) Ar, , 2211 (N_3), 1367, 1162 (O=S=O),. ^{1} H-NMR (DMSO-d6, δ, ppm): 7.79-6.55 (m, 12H, Ar-H), 4.21 (s,

1H, NH), 2.24 (s, 3H, CH_3). 2.41-1.51 (m. 10H.,cyclohexyl ring). ^{13}C-NMR (DMSO-d_6) δ ppm : (115.8-150.1) (C-Ar ring), (40.7-22.6) (C- cyclohexyl ring),(20.9) (C-methyl group.) Anal. Calcd for $C_{25}H_{26}N_4O_2S$ (Mol. Wt.: 446.56), C, 67.24; H, 5.87; N, 12.55; S, 7.18 Found: C, 67.52; H, 5.74; N, 12.76; S, 5.16.

7. Synthesis of 5-Methyl-1-(4-{1-[4-(toluene-4-sulfonylamino)-phenyl]-cyclohexyl}-phenyl)-1H-[1,2,3]triazole -4-carboxylic acid .(A7)

A mixture of azide compound (6) (0.01 mole ,4.46 gm) and ethyl acetoacetate (0.01 mol , 1.03 mL) in absolute ethanol (30 mL) was cooled to 0˚C .sodium ethoxide (0.01 mol) in (20 mL) was added gradually to the mixture and heated under reflux on a water bath for 6h .The crude product was recrystallized from acetone.

5-Methyl-1-(4-{1-[4-(toluene-4-sulfonylamino)-phenyl]-cyclohexyl}-phenyl)-1H-[1,2,3]triazole-4-carboxylic acid .(A7)

Yield: 80% ; M.p: 233-234°C ; FT-IR (v, cm^{-1}): 3350-3250 (O-H), 3244 (N-H), 3105, 3037 (C-H)Ar, 2940 ,2887 (C-H)Aliph,,1658–1484 (C=C) Ar,1699 (C=O) ,1355,1160 (O=S=O).^{1}H-NMR(DMSO-d6, δ, ppm):10.91(s,1H, O-H),7.81-6.88 (m, 12H, Ar-H), 4.54 (s, 1H, NH), 3.32 (s, 3H, CH_3),3.13(s ,3H,triazole) and at δ 2.34-1.29 ppm(m. 10H.,cyclohexyl ring). ^{13}C-NMR (DMSO-d_6) δ ppm; 172.2 (C=O) , 115.6-153.3 (C-Ar. ring),39.7-21.9 (C-cyclohexyl ring), 20.9(C- methyl group.) Calcd for $C_{29}H_{30}N_4O_4S$ (Mol. Wt.: 530.64), C, 65.64; H, 5.70; N, 10.56; O, 12.06; S, 6.04 Found: C, 64.99; H, 5.79; N, 10.46; ; S, 6.16.

8. Synethesis of N-(4-{1-[4-(4-Acetyl-5-methyl-[1,2,3]triazol-1-yl)-phenyl]-cyclohexyl}-phenyl)-4-methyl-benzenesulfonamide[8]

To a cold solution of sodium ethoxide (7 ml) and acetyl acetone (0.01 mole ,1.3 g) ,azide compound (6) (0.01 mole,4.46gm) was cautiously added and the mixture was heated under reflux on a water bath for 3h . The resulting solid was separated and recrystallized from chloroform .

N-(4-{1-[4-(4-Acetyl-5-methyl-[1,2,3]triazol-1-yl)-phenyl]-cyclohexyl}-phenyl)-4-methyl-benzenesulfonamide[8]

Yield: 63%. M.p.: 191-192 °C. FT-IR (v, cm^{-1}): 3208 (N-H) ,1676(C=O), 3120, 3065 (C-H)Ar, 2940 ,2867 (C-H)Aliph,,1665–1496 (C=C) Ar,1367,1181 (O=S=O).:^{1}H-NMR (DMSO-d6, δ, ppm): 7.87-6.88 (m, 12H, Ar-H), 4.36 (s, 1H, NH), 2.33 (s ,3H, CH_3 triazole) , 2.35 (s ,3H ,CH3CO), 2.06-1.51 (m. 10H.,cyclohexyl ring), 2.21(s 1H,CH_3). ^{13}C-NMR (DMSO-d_6) δ ppm :196.2 (C=O) , 115.6-153.3 (C-Ar rings), 39.7-21.9 (C-cyclohexyl ring), (20.9 -19.8) (C-methyl group.) . Calcd for $C_{30}H_{32}N_4O_3S$ (Mol. Wt.: 528.22), C, 68.16; H, 6.10; N, 10.60; S, 6.07 Found: C, 67.99; H, 5.99; N, 10.76; S, 6.16.

2.2. Biological Activity

The compounds (1-8) were vetted for their antimicrobial activity. For antibacterial studies have used bacteria *:Staphylococcus aureus , Becillus Cereus ,Escherichia coli , Pseudomonas aeruginosa* . For antifungals , *Aspergillus niger an dAspergillu fumigatus* were used . Both microbial studies were evaluated by Minimum Inhibitory Concentration (MIC) by using serial dilution method . For this purpose , the compound whose MIC has to be determined is dissolved in diluted DMSO . Then a standard drop of the culture prepared for the try is added to each of the dilutions , and incubated for 20–22 hrs at 37^0C. Minimum Inhibitory Concentration (MIC) is the highest dilution of the compound , which shows clear liquid with no turbidity in the solution. The results are tabled in the table [1]

3. Results and discussion

The synthesis of new sulfonamide derivatives are preparing the following reaction series showed in scheme 1. Compound [A2] is prepared by reaction toluene -4- Sulfonyl chloride with compound [1, 1- bis (4-aminophenyl) cyclohexane and triethyl amine in dry benzene. The structure of compound was confirmed by melting point (m.p) and spectral data . FTIR spectrum of compound (A2) showed absorption bands at 3359 ,3272 (NH_2), 3265 (NH),1390,1165 (O=S=O) group. The same compound showed stretching absorption bands at.(3097,3047)(C-H) Ar., 2975,2855 (C-H) Aliph., 1666–1457 (C=C) Ar., The ^{1}H-NMR spectra of compound (A2) showed singlets at δ =2.5 ppm (s, 3H, CH_3) and at δ= 2.30-1.4 ppm(m. 10H.,cyclohexyl ring), 7.3-7.9 (m, 12H, Ar-H), 8.5 (s, 2H, NH_2) , 6.3 (s, 1H, NH) .

^{13}C-NMR spectrum of the same compound showed signals at δ= (124-144) ppm, 21.0 ppm and 22.1-29.7 ppm due to aromatic ring carbons, carbon methyl group and cyclohexyl ring carbons .Usage of sulfonamide (A2) with sodium nitrite in acid medium (hydrochloric acid) at 0-5°C gave the diazonium salt .The compound (A3) was synthesiszed by coupling between diazoniuim salt of amino sulfonamide derivative with aromatic aldehyde (salicylaldehyde) [J .Mcmurry 2004]. FTIR absorption bands of compound (A3) exhibited the disappearancs of two absorption bands due to NH_2 stretching of compound (A2) together with the appearance of stretching band at 1545 cm^{-1}due to N=N group ,which it also shows stretching abroa dband 3408-3124 cm^{-1} due to O-H group .^{1}H-NMR spectrum of compound (A3) shown singlet signals 2.99 ppm was assigned to methyl group , 10.01 ppm was attributed to O-H proton ,singlet at 4.14 ppm related to NH, doublet of doublet at 8.34- 7.30 ppm belong to (15H, Ar-H),which is interference with the proton of salicylaldehyde ring , singlet at 9.97 ppm due to proton of aldehyde . and at δ 2.31-1.78 ppm(m. 10H.,cyclohexyl ring).^{13}C-NMR spectrum of the same compound showed

signals at δ= (123.8-159.1.1) ppm, δ= (27.9-24.1) ppm ,δ= 20.1 ppm , δ= 180.1 ppm due to aromatic ring carbons , cyclohexyl ring carbons and (CH_3) and carbon aldehyde(C=O) respectively.

On the other hand, the reaction of compound (A3) with acetophenone afforded chalcones deravtive (A4).FTIR spectrum of compound (A4) showed a bands at 3250 (N-H), 1670 cm−1,1634 cm−1 due to(C=O and C=C) of α, β –unsaturated compound respectively.^{1}H-NMR spectrum of chalcones compound exhibited singlet signal : at 2.3 ppm was assigned to CH3 Protons, 4.6 7 ppm was attributed to N-H proton, 5.74 ppm due to O-H proton. Amultiplet signals at 8.37-7.73 ppm due to 20 H aromatic protons and dublet singal peak at 7.62 ppm belong to (CH=CH) . and at δ 2.42-1.49 ppm (m. 10H.,cyclohexyl ring),

^{13}C-NMR spectrum of compound [A4] showed signals at δ= (115.3- 157.7) ppm due to aromatic ring carbons and (C=C) at δ= 39.7-21.9 ppm for cyclohexyl ring carbons and δ= 20.9 ppm (CH_3) respectively.

The formation of Schiff base (A5) was characterized by FTIR spectra of azomethine (CH=N) stretching band at 1625 cm^{-1} combined with the disappearance of NH_2 stretching band of amine in (2-amino pyrimidine) and carbonyl group of compound (A3).The ^{1}H-NMR spectrum of compound (A5) exhibited four singlet signal (3.29, 4.35, 5.33 ,8.56) ppm were assigned to CH_3, NH, O-H , N=CH, Amultiplet signals at (8.3-8.0, 7.97-6.78)ppm due to 18 proton aromatic and pyrimidine) and signals at δ (2.35-1.98) ppm due to 10H cyclohexyl ring). ^{13}C-NMR spectrum of the same compound showed signal at δ= 164.3.6 ppm due to (-CH=N-) carbon and signals at δ= (115.8-150.1) ppm, δ= 39.7-21.9 ppm and δ= 20.9 ppm due to aromatic ring carbons, cyclohexyl ring carbons and (CH_3) . Reaction of diazonium salt with sodium azide gave N-{4-[1-(4-Azido-phenyl)-cyclohexyl]-phenyl}-4-methyl-benzenesulfonamide (A6)**.**The FTIR spectrum of compound (6) showed new absorption bands at 2211 cm^{-1} due to stretching vibration of N3and band at 3244 cm^{-1} due to stretching vibration of N-H. The ^{1}H-NMR showed singlet signals 2.24ppm assigned to three protons of methyl group and 4.21 ppm was attributed to N-H proton .The aromatic protons were appeared at δ 7.79 - 6.55 ppm. and the cyclohexyl protons were appeared at δ 2.41-1.51 ppm.^{13}C-NMR spectrum showed signal at δ= (115.8-150.1) ppm, δ= 40.7-22.6 ppm and δ= 20.9 ppm due to aromatic ring carbons, cyclohexyl ring carbons and carbon methyl group.

Reaction of compound azide derivatives (6) with acetylacetone in the presence of sodium ethoxide to give compound (7). FTIR absorption bands of triazole compound showed the disappearancs of absorption bands due to N_3 stretching of compound (6) together with the appearance of stretching band at 1699 cm^{-1} due to C=O group.The ^{1}H-NMR showed singlet signals at (3.13,2.32,4.54,10.91)ppm assigned to four protons of methyl group ,triazole ring , NH and O-H .The aromatic protons were appeared at δ 7.81-6.88 ppm. and the cyclohexyl protons were appeared at δ 2.34-1.29 ppm .^{13}C-NMR spectrum showed signal at δ= 172.2 ppm due to (CO) carbon and signals at δ= (115.6-153.3) ppm, δ= 39.7-21.9 ppm and δ= 20.9 ppm due to aromatic ring carbons,

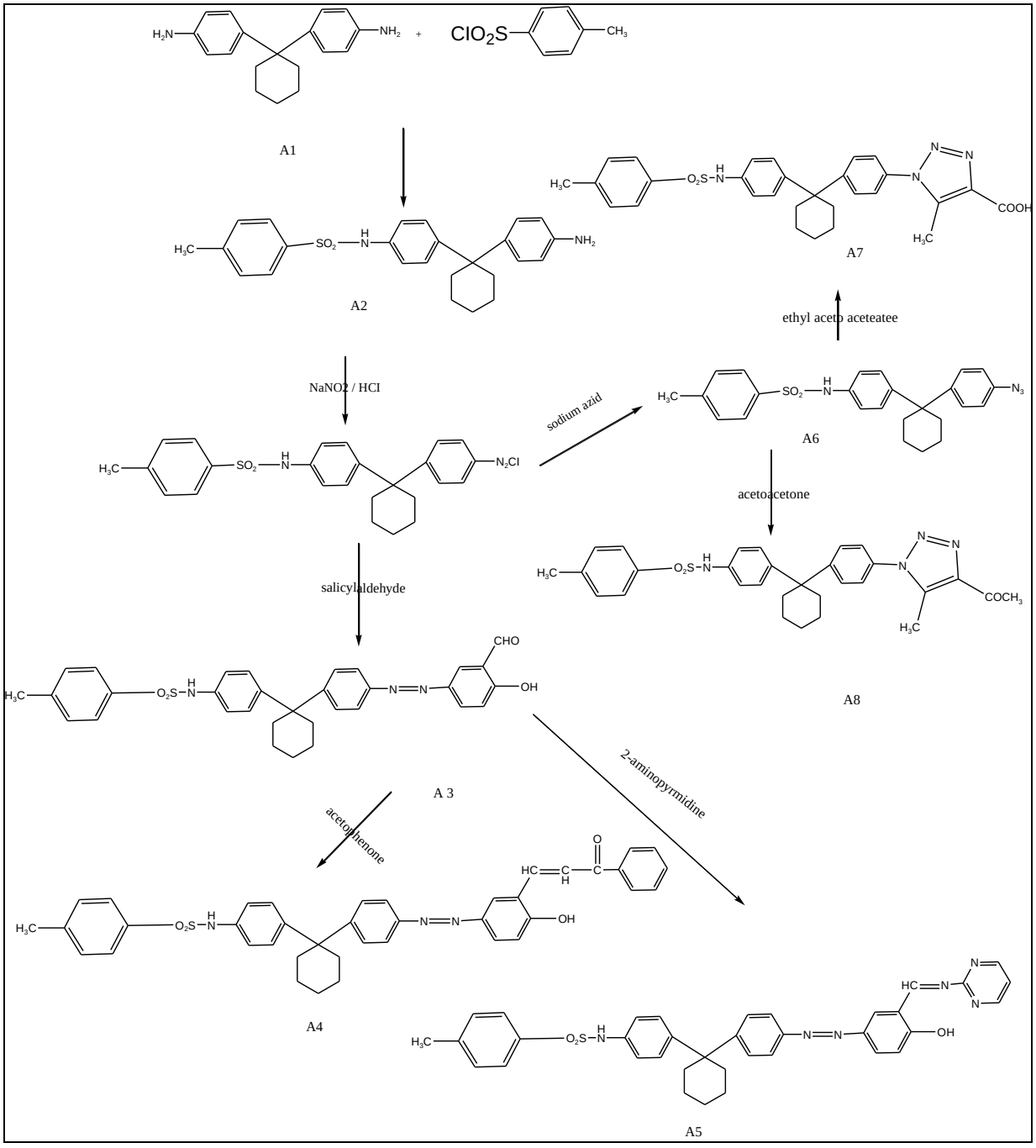
cyclohexyl ring carbons and (CH_3). In addition, cyclization of azide compound with ethylacetoacetate afforded triazole deravtive (8). The FTIR spectrum of compound (8) showed sharp absorption band at 1676 cm^{-1} is attributed to (C=O), H-NMR spectrum of compound (8) singlet signals at : (2.24, 2.35, 2.33,4.36) ppm due to protons (CH3 , CH3CO ,CH3 and NH) , The aromatic protons were appeared at δ 7.87-6.88 ppm and. and the cyclohexyl protons were appeared at δ 2.12-1.51 ppm (m. 10H ,cyclohexyl ring). ^{13}C-NMR spectrum showed signal at δ= 196.2 ppm due to (CO) carbon and signals at δ= (115.6-153.3) ppm, δ= 39.7-21.9 ppm and δ= 20.9 -19.8 ppm due to aromatic ring carbons, cyclohexyl ring carbons and (CH_3).

Antimicrobial Activity

The derivative sulfonamide containing azo,1,2,3-triazole , Schiff base , chalcone moieties which is accountable for antimicrobial activity . It seems that the compounds A2,A6 are very significant for activity against both bacterial for antimicrobial activity . All the compounds were found to reveal moderate to good antifungal .Standard antibacterial treatment (Ampicillin) and antifungal treatment (Fluconazole) were utilized for comparision . The examinations have been performed in triplicate keeping in mind minimize blunders

Table [1]

Com.NO.	**Antibacterial data in MIC(µg/ml)**				**Antifungal data in MIC (µg/ml)**	
	Gram +ve Bacteria		**Gram -ve Bacteria**			
	S. aureus	***B. cereus***	***P. aeruginosa***	***E.coli***	***A.niger***	***A.fumigatus***
A1	8	8	5	7	15	17
A2	8	9	10	9	16	15
A3	5	4	7	6	18	14
A4	8	6	9	9	16	18
A5	6	7	6	7	16	17
A6	8	8	9	9	17	17
A7	6	7	4	5	13	12
A8	7	5	8	6	15	14
A9	8	4	6	6	18	20
Streptomycin	10	9	12	10	--	--
Fluconazole	--	--	--	--	20	22


A1
A2
A7
ethyl aceto aceteatee
NaNO2 / HCl
sodium azid
A6
acetoacetone
salicylaldehyde
A8
A 3
2-aminopyrmidine
acetophenone
A4
A5

Scheme [1]

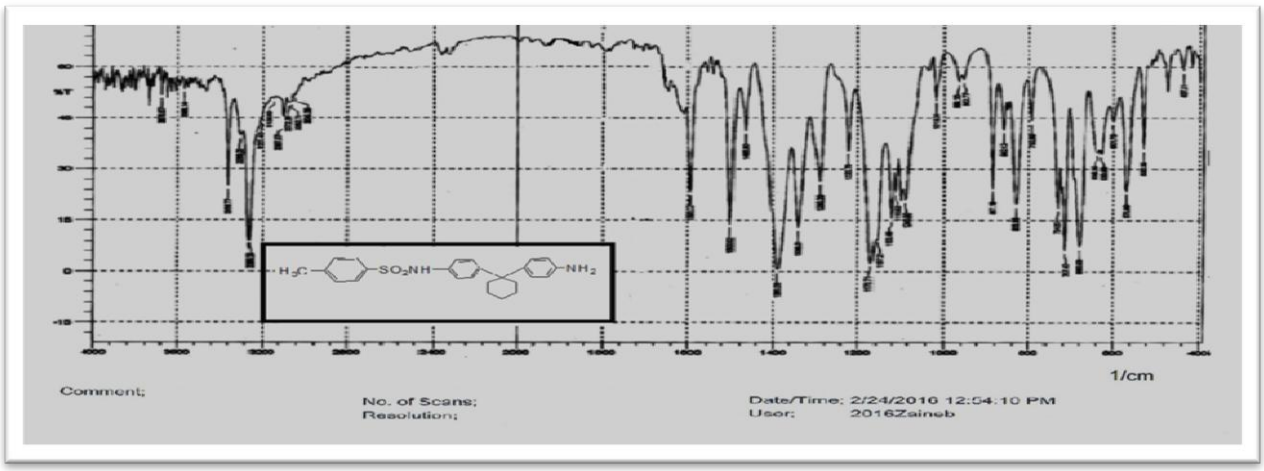


Fig. No. (1) : FT- IR spectrum for compound [A2]

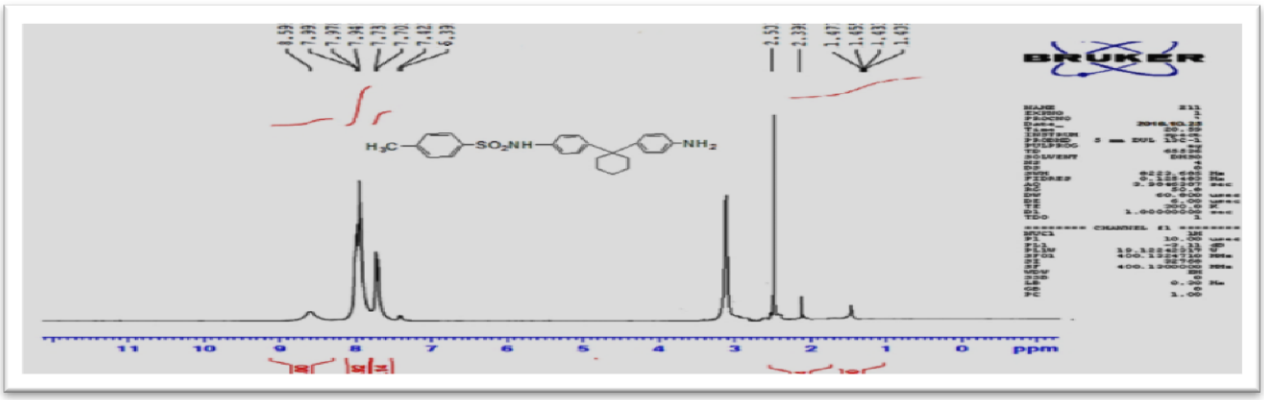


Fig. No. (2) : ^{1}H-NMR spectrum for compound [A2]

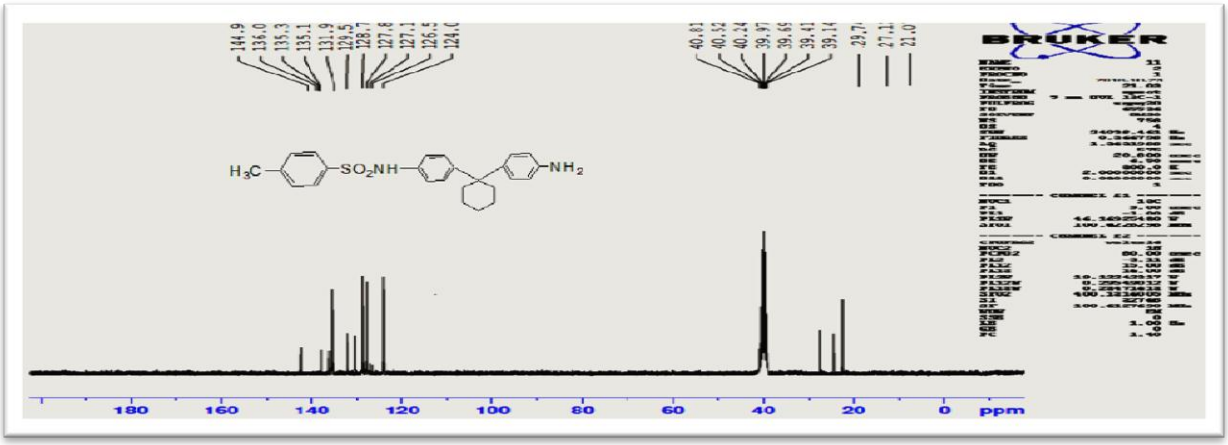


Fig. No. (3) : ^{13}C-NMR spectrum for compound [A2]

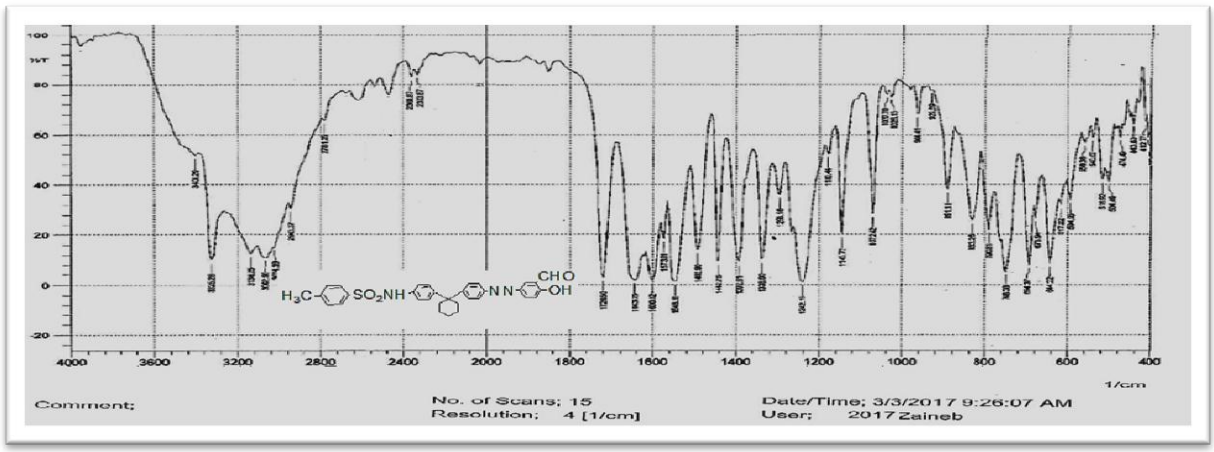


Fig. No. (4) : FT- IR spectrum for compound [A3]

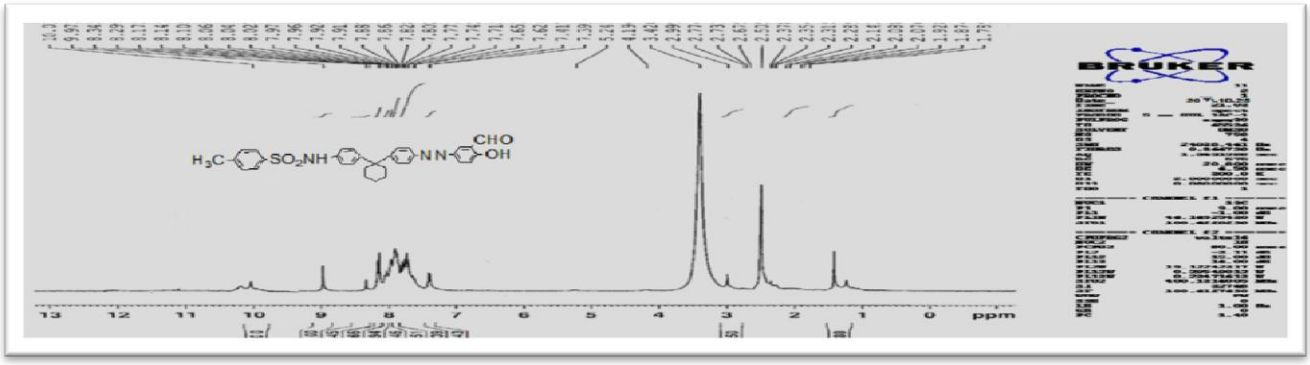


Fig. No. (5) : ^{1}H-NMR spectrum for compound [A3]

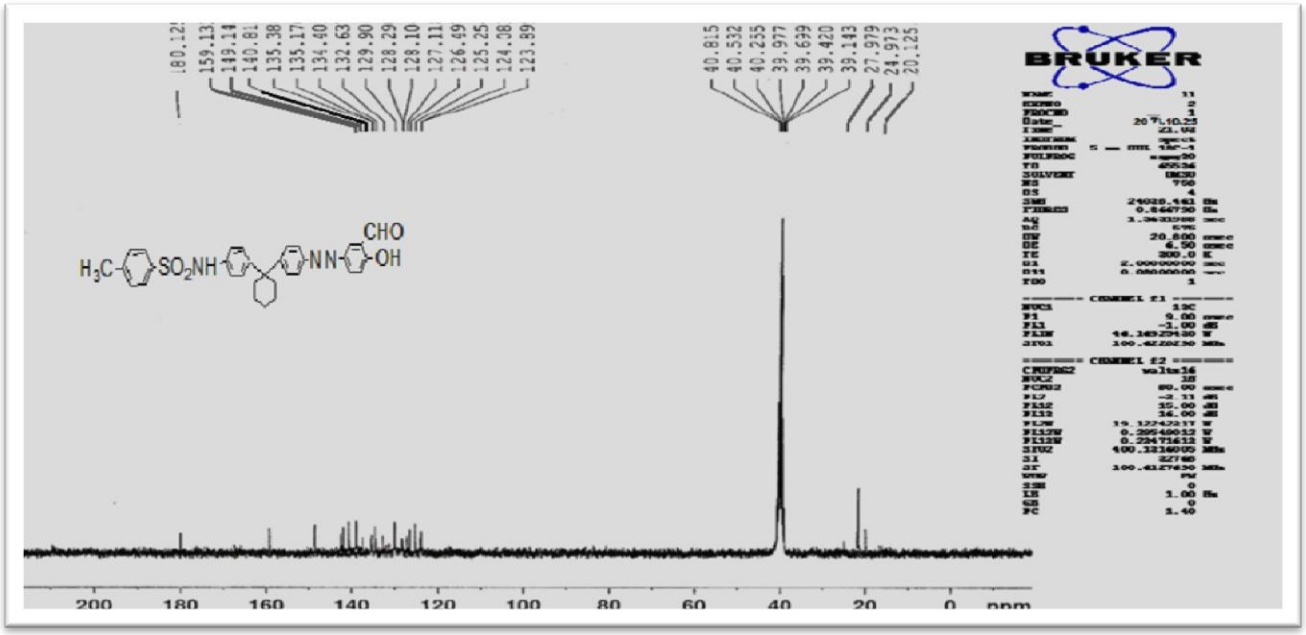


Fig. No. (6) : ^{13}CH-NMR spectrum for compound [A3]

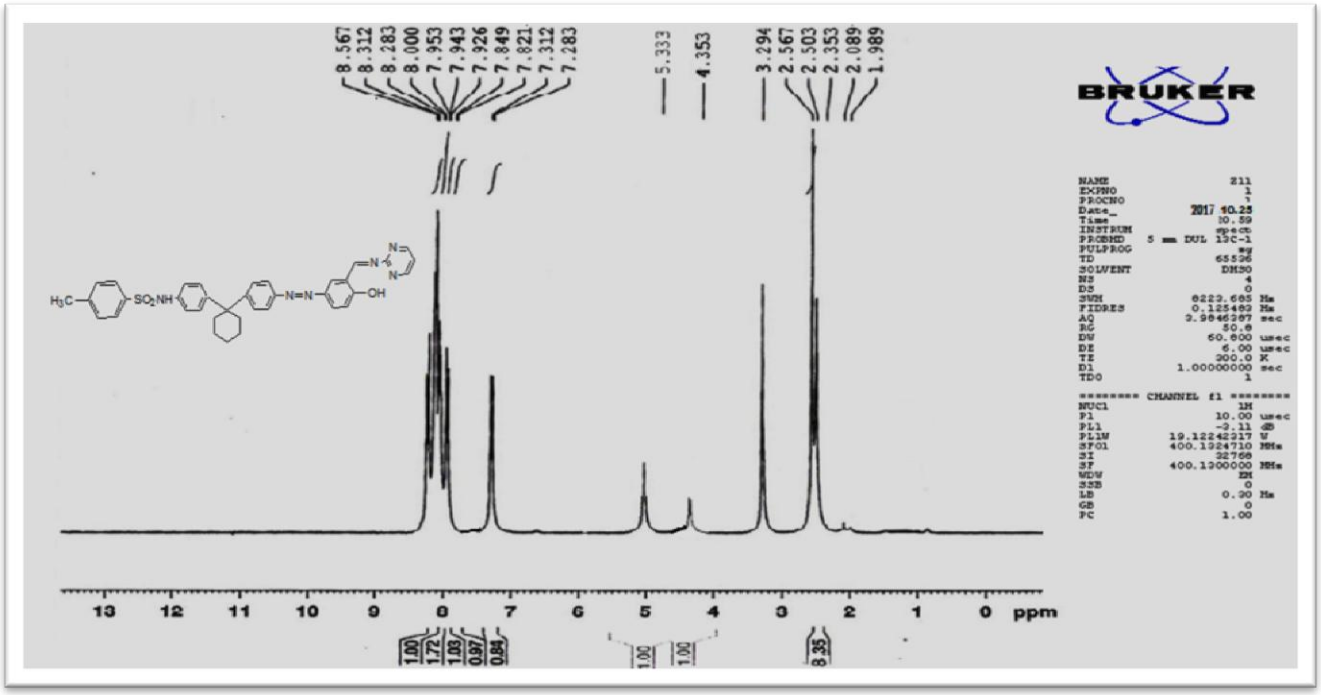


Fig. No. (7) : ^{1}H-NMR spectrum for compound [A5]

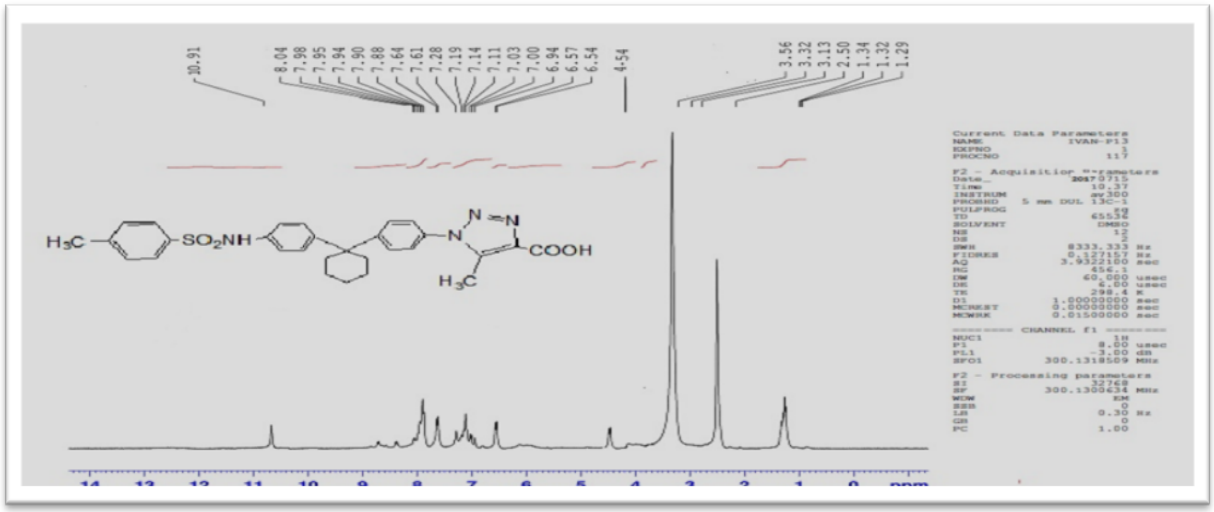


Fig. No. (8) : ^{1}H-NMR spectrum for compound [A7]

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الخلاصة

تحضير وتشخيص المركبات غير المتجانسة المشتقة من ١، ١- ثنائي (٤-أمينوفينيل) سيكلوهكسان ودراسة نشاطها البايولوجي

الفه عبد نايف *، ابتهال قحطان عبدالله **، هاله محمد غريب ***، ناهدة عبد الله .جينزيل*
*قسم الكيمياء، كلية العلوم، الجامعة المستنصرية، بغداد، العراق
**قسم الكيمياء، كلية العلوم، جامعة تكريت، تكريت، العراق
***قسم الكيمياء، كلية العلوم، جامعة كركوك، كركوك، العراق

تحضير وتشخيص مشتقات السلفوناميد الجديدة (قاعدة شيف، أزو، أزيد، جالكون و ١،٢،٣- ترايازول) المشتقه من (١، ١- ثنائي (٤- امينوفنيل] سيكلوهكسان [A1]. يتضمن تحضيرالمركب [A2] تفاعل المركب[A1] مع تلوين – ٤-سلفونيل كلورايد بينما مركب الازو[A3] ينتج من تفاعل ملح الديازونيوم مع الساليسيالديهايد ، ثم يتم تحويل مركب أزو[A3] إلى مشتق جالكون [A4] من خلال تفاعل مركب أزو [A3] مع الأسيتوفينون. بعد ذلك تصعيد مركب أزو[A3] مع ٢-أمينو بيريميدين لتكوين قاعدة شيف [A5]. مشتق أزيد [A6] حضره بتفاعل ملح الديازونيوم مع أزيد الصوديوم . تم الحصول على مشتقات ١و٢و٣- ترايازول الجديدة [A8,A7] من معامله مركب أزيد [A6] مع كل اثيل أسيتوسيتات وأسيتيل أسيتون، على التوالي. تم تأكيد الهياكل الكيميائية للمركبات المحضره بواسطة التحليل الطيفي ^{1}H-NMR، ^{13}C-NMR، FT-IR و التحليل العناصر(C.H.N.). تم فحص هذه المركبات للمضاد للبكتيريا (*Staphylococcus aureus , Becillus Cereus, Escherichia coli, Pseudomonas aeruginosa*) ومضادة للفطريات *Aspergillus niger* and *Aspergillus fumigatus* بواسطة طريقة التخفيف المسلسل